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Four Edge Moor Waste Heat Boilers totalling 2968 h. p. at the Petoskey Portland Cement Co.'s 4500 barrel mill at Petoskey, Michigan, not only provide all the power used in the mill itself, but supply a profitable surplus as well. This surplus power has been used for crushing large quantities of stone sold for highway construction, has been purchased by another cement plant, and by the City of Petoskey during the shutdown of its hydro-electric plant due to low water in summer.

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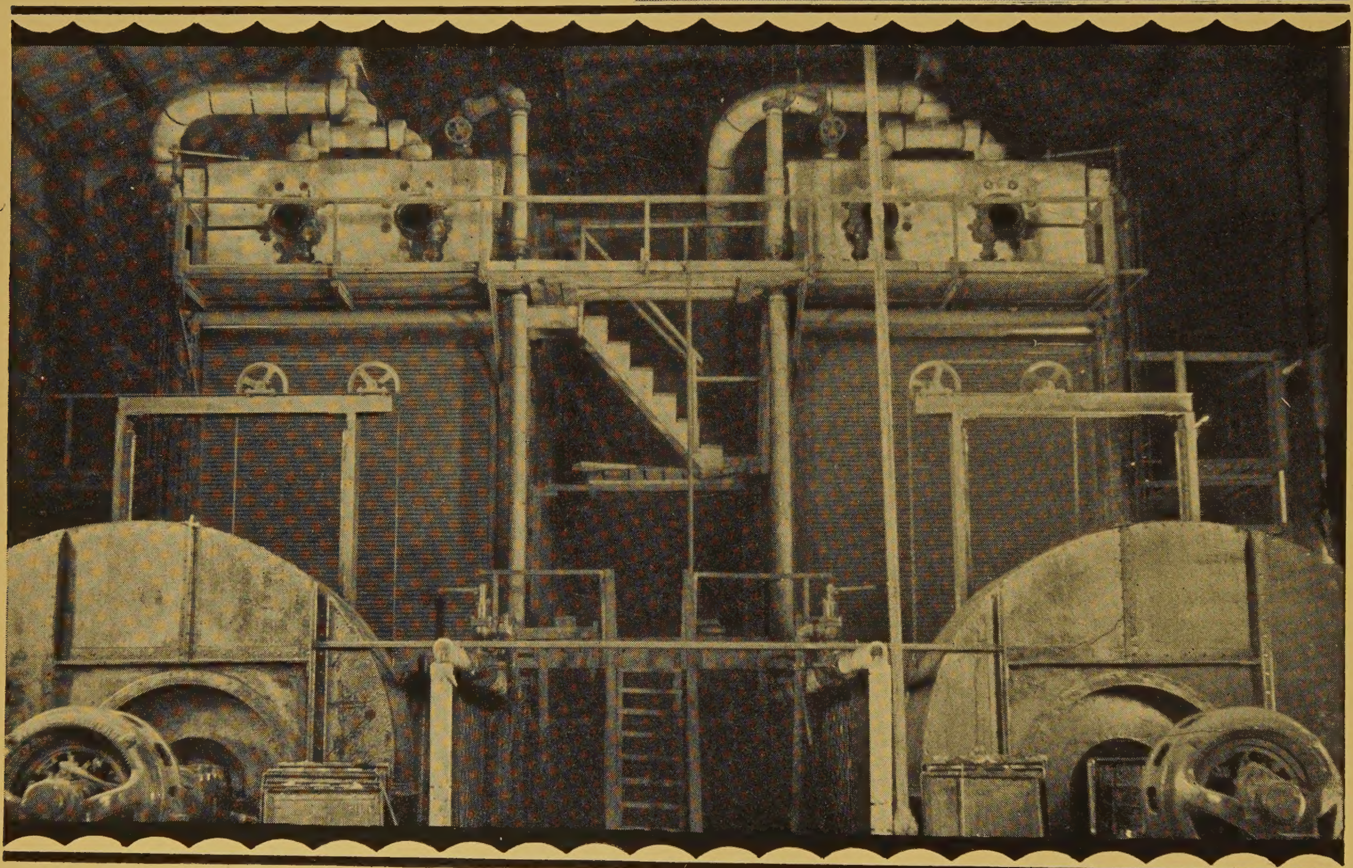

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MILL SECTION of

Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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MILL SECTION of

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Vol. 37 Chicago, November, 1930 No. 5

Universal Atlas Bulk Cement Barge is Self-Unloading

To Transport Bulk Cement From Mill—Capacity of Vessel is 9,500 Barrels—Will Unload in Ten Hours—All Unloading Equipment Electric-Driven—Dust Recovery System Installed

AN all-steel bulk cement tow barge for delivering lake shipments of portland cement from the Buffington, Indiana, plant of the Universal Atlas Cement Company to the company's warehouses is to be launched on or about November 10th on the North Branch of the Chicago River. Several illustrations taken on October 21st show the vessel rapidly approaching completion.

The barge is a single-tunnel tow type, with the following dimensions:

Length	226 ft.
Beam	40 ft.
Molded depth	12 ft. 6 in.
Depth from keel to upper deck	18 ft.

The capacity of the barge will be 9,500 barrels of cement with a draft of 9 ft. and 6 in. So far as cement is concerned, the cargo capacity is determined by the draft rather than the capacity of the holds. With lighter material, such as lime, the hold capacity might be the determining factor.

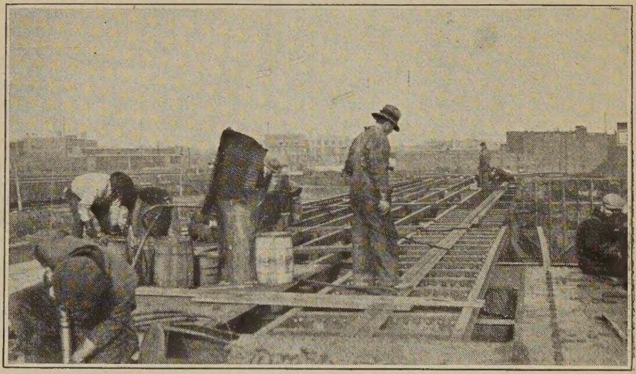
The Unloading System

The unloading system can be understood most readily from a study of the line drawings in the accompanying full-page illustration. It consists of the Leathem D. Smith self-unloading system combined with a 10-in. Fuller-Kinyon pump which delivers the cement to the dock.

The unloading system consists essentially of a single longitudinal tunnel extending through the entire length of the cargo hold, and a 4-yd. crescent-shaped scraper, open at the top and bottom, which drags the cement along the tunnel bottom and up an incline to a hopper above the pump. The features just mentioned are shown to best advantage in the full-page illustration, particularly in the typical section, in the inboard profile and in the plan of the tank top.

Another illustration which shows the interior to good advantage is the large photograph, this view having been taken from a point in the unfinished part of the tunnel, looking lengthwise along the hold and toward the finished part of the tunnel. Workmen are placing the steel plates that form the slopes of the hold. This view should be compared with the typical section in the lower right-hand part of the full-page illustration. The 4-yd. scraper, as previously stated, operates in this tunnel.

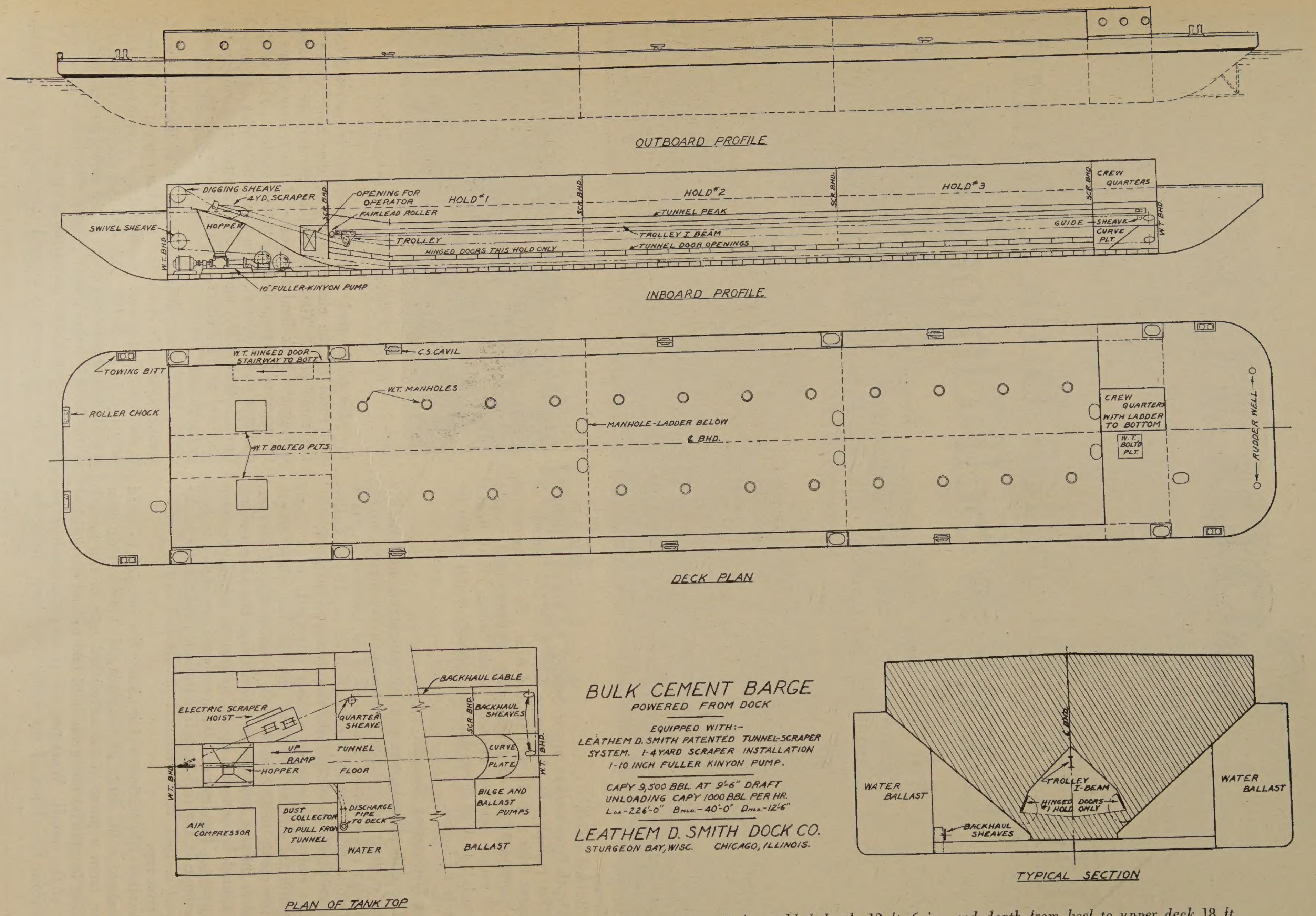
After the 4-yd. load has been dumped into the hopper above the cement pump the scraper is returned to the other end of the tunnel by means of a back-haul cable shown in the plan of the tank top. The scraper is operated back and forth by the electric-driven scraper hoist shown in the same plan. The rear end of the scraper is raised during the back haul by means of the trolley shown at the apex of the tunnel in the typical section. This trolley operates on an I-beam. The back-haul cables are reeved through the trolley, and this has the effect of raising the rear end of the scraper so that it passes over the material in the tunnel.



Workmen placing steel plates on upper deck

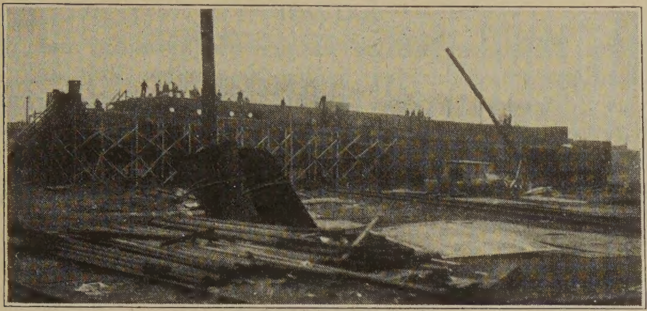
One of the most definite advantages of this tunnel-and-scraper system is in the fact that the cement is delivered to the conveying system (the tunnel and scraper) at a level very low in the hold. This has the effect of materially lowering the center of gravity of the cargo, and the cubage of the hold is considerably greater than in conveying systems requiring greater head room.

After the cement is scraped into the hopper shown at



General plans, profiles and sections of barge and equipment. Length is 226 ft., beam 40 ft., molded depth, 12 ft. 6 in., and depth from keel to upper deck 18 ft.

the left end of the inboard profile and in the plan of the tank top it is fed into the Fuller-Kinyon cement pump, which carries the material through a fixed 10-in. pipe line to the upper deck. Here the pipe is connected up with a flexible pipe line or hose, through which the cement is conveyed to the warehouse storage bins. The electric power used for the operation of the unloading system is obtained from a connection on the dock. The air compressor employed in the operation of the cement pump is installed in the vessel.



Universal Atlas bulk cement barge, 226 ft. long and 40 ft. beam, under construction

Rate of Unloading

The unloading will be accomplished at the rate of 1,000 barrels of cement per hour, so that the unloading of a full cargo should require around 10 hours of actual operating time.

Dust Collection System on Barge

A system of dust recovery is installed near the forward end of the tunnel, for the purpose of removing and recovering the cement dust in the tunnel. The location of this installation is shown in the plan of the tank top.

Acknowledgments

The Leathem D. Smith Dock Company, of Sturgeon Bay, Wis., and Chicago, Ill., designed and furnished the entire scraper system, including the electric-driven scraper hoist, the scraper itself and all auxiliary equipment. They also made the general design for the tunnel and the hopper. The barge hull proper was designed, detailed and fabricated by the American Bridge Company, Gary, Ind. The dust collector was supplied by the Parsons-Thompson Engineering Company, of Cleveland, Ohio. A considerable part of the detailed designs was supplied by the engineering department of the Universal Atlas Cement Company. This department is also maintaining continuous inspection and general supervision in behalf of the cement company.

Crescent Resumes Operation

The Crescent Portland Cement Company plant at Wampum, Pa., resumed operation on Monday, September 15th, when about 225 persons returned to work.

View of interior construction of barge, from point in unfinished part of tunnel, looking along hold and toward finished part of tunnel

Construction of Yazoo Plant to Begin at Early Date

Contracts are about to be let by the Yazoo Portland Cement Company for the construction of a 1,000,000-barrel a year cement plant north of Vicksburg, Miss. Construction will begin as soon as possible. Plans provide for the wet process, and the use of slurry filters and waste heat boilers.

Offices were opened at Vicksburg during October. Ralph T. Miller of Nashville, Tenn., is president of the company, and other officials are St. George T. Cordell, also of Nashville, secretary-treasurer; G. I. Frazier, Memphis, and Galvin Hudson.

The management of the plant will be under the supervision of Mr. Miller, who promoted, designed and built the Hermitage Portland Cement Company plant at Nashville and operated it as general manager for two years. He also designed and built the Cumberland Portland plant at Cowan, Tenn., and was vice-president and manager for two years.

French Importations of Cement Show Big Increase

Statistics for the first half of 1930 show a tremendous increase in the importations of cement into France and a drop in exportations. Official figures for the period are as follows:

IMPORTATIONS

Standard portland cement from—	1930	1929
Germany	40,143 tons	29,756 tons
Belgium-Luxembourg	66,099 tons	28,446 tons
Switzerland	54,476 tons	24,117 tons
Other countries	173 tons	16 tons
Total	160,891 tons	82,335 tons
Value	27,758,000 fr.	13,930,000 fr.

EXPORTATIONS

	1930	1929
Standard portland cement	299,460 tons	312,981 tons
Value	73,779,000 fr.	71,515,000 fr.

IMPORTATIONS

	1930	1929
Rapid hardening cement	6,670 tons	1,230 tons
Value	7,110,000 fr.	239,000 fr.

EXPORTATIONS

	1930	1929
Rapid hardening cement	35,870 tons	36,091 tons
Value	9,874,000 fr.	8,791,000 fr.

Increase Over Previous Quarter Shown in International Earnings

In its earnings report for the third quarter, International Cement Corporation reports a net income of $1,395,003, equal to $2.20 a share, against $1,210,283, or $1.91 a share, in the previous quarter, and $1,360,356, or $2.20 a share, on a slightly smaller capitalization in the third 1929 quarter. Net for the nine months to September 30th last was $3,446,766, equal to $5.44 a share on 633,432 shares, against $3,527,764, or $5.70 a share on 619,049 shares in the same period of 1929.

International Cement's net profit for the full year 1930 is estimated by interests close to the corporation, at about $7.50 a share. This would compare with net of $4,950,433, or $7.88 a share earned on 627,865 shares in 1929. The corporation continues to improve cash position. After payment of September 30th dividend disbursement cash was in excess of $3,500,000, against $1,900,000 on January 1st, 1930.

Pennsylvania-Dixie Year's Earnings Lower

The Pennsylvania-Dixie Cement Corporation and its subsidiaries for the year ended September 30th had a consolidated net income of $417,192 after depreciation, depletion, interest and federal taxes, equal to $3.07 a share on the 7 per cent preferred stock, against a profit of $686,072, or $5.05 a preferred share in the preceding twelve months.

Marquette Improvement Nearing Completion

Work on two 60 ft. silos, sand and rock bins and elevators of the Marquette Cement Mfg. Co. at Memphis, Tenn., was to be completed November 1st. Work started two months ago.

Other contemplated improvements include a central mixing plant, and four new barges.

Virginia Plant of Lehigh Resumes Full-Time Operation

The Lehigh Portland Cement Company plant at Fordwick, Virginia, resumed full-time operation on October 1st, after having run on half-time for more than a year.

Installation of new separating machinery was recently completed.

Cut in Common Earnings of Lehigh

The Lehigh Portland Cement Company has declared a quarterly dividend of 25 cents on its common stock, payable November 1st to stock of record October 14th. This places the stock on a $1 annual basis against the $2.50 previously.

Lehigh Plant on Part-Time Basis

Beginning Monday, October 10th, the Iola, Kansas, plant of the Lehigh Portland Cement Company reduced its operating time to four days a week, to continue for an indefinite period.

New Unat Packing Plant

The new storage and packing plant of the Universal Atlas Cement Company at Homestead, near Pittsburgh, Pa., began operation on September 17th. Cement is shipped to the plant in bulk and sacked for distribution in the Pittsburgh district.

Pacific Portland Dividend

The regular quarterly dividend of $1.62½ a share on preferred stock, payable October 4th to stockholders of record September 30th, was declared by directors of the Pacific Portland Cement Company.

Bessemer Earnings

The Bessemer Limestone and Cement Company reports as earned in the first nine months of this year $2.04 a share on the Class B stock, against $2.19 in the corresponding period of 1929.

Sources of Blue Colors for Use With Portland Cement

Azure or Cobalt Blues Last Well and Are Best for Purpose—Twenty Principal Sources of Cobalt Blue from Industrial Waste Products — Recovery Processes and Proportions for Mixtures — Appreciable Demand in Europe for All-Blue Cements—Used Much in Mortars and Roofing Tile

By E. T. ELLIS, F. J. I.
Ecclesall, Sheffield, England

It will be recollected that in three former articles[1] on this subject the author gave brief accounts of unexploited sources of red, black, and yellow cements, or more accurately, the coloring agents used in the preparation of such. In the present article he takes up unexploited sources of coloring agents where a blue cement is wanted, and discusses these in a manner similar to that adopted in the three previous instances.—The Editors.

SOME readers may not have seen the writer's earlier articles on the subject of colored cements,[1] and it will, therefore, be wise to reiterate, in order that there may be no confusion in the matter, that the coloring of cements of every sort is invariably a distinct or subsidiary process, and takes place after original manufacture. That is, the cement is burned and ground in the ordinary way, after which a suitable coloring agent, in this instance blue, is mechanically mixed with it. There are a great many cement makers who are still under the entirely erroneous impression that blues and other colors can be chemically combined with the cement during the initial manufacture; but up to now, although this can be carried out in the laboratory, it is very far from being satisfactory on a large scale. In spite of this fact, separation of the pigments from the cements after the two have been mixed together is an extremely difficult matter.

Just as in the case of the other three coloring agents previously described, any first class brand of portland cement may be used as the starting point in the preparation of blue cement. Those cements, however, which do not come within the portland cement group are less suitable for employment, although some of them have been colored by lake pigments more or less satisfactorily.

Some Blue Cements and Their Uses

An appreciable demand has already shown itself in Europe and elsewhere for all-blue cements. This term excludes various purples and blue-greens which as a matter of fact are extremely difficult to prepare with any accuracy. On the other hand, it includes pale blues, medium blues, and dark blues. These three shades, of course, merge into each other, and can be obtained by merely increasing or decreasing the amount of original pigments. This is not the case, however, with the purple and other shades, as additional coloring agents have to be used, as was pointed out in some detail when discussing the yellow cements.[2] It is not considered necessary, however, to take up more than three shades of blues, as cement manufacturers will find that these are sufficiently wide in hue to meet with all ordinary requirements.

Blue is a color which stands well, and cement colored with blue pigments, therefore, ought to be much more widely used than it has been. The use of blue cement mortars is specially desirable when blue building bricks are used for the structure itself. Blue cement ought to be very largely used in the manufacture of low-cost roofing tiles, using a small quantity of pigment, as the grey-blue appearance of these is very much less glaring than the bright red roofing tiles which are becoming so common.

Azure Blue or Cobalt Blue

Cement manufacturers will obviously know that a large number of blue pigments have been introduced. Nearly all can be ruled out as being entirely unsuitable for use as cement makers' coloring agents. The most popular blue for this purpose is a complex compound pigment known mainly as azure blue or cobalt blue, but it goes under a great many other names such as cobalt ultramarine, cobaltine blue, cobaltite blue, smaltite blue, ceramic blue, etc. It must be carefully distinguished from several other cobalt blues which are not so lasting, and analysis should show that it consists mainly of cobalt oxide and alumina, though one form which is fairly durable contains some cobalt phosphate. Permanence is again a matter of the greatest importance, and most of the cheaper blue pigments, as was the case with the yellows and others, are all too liable to change in contact with the cement itself, or under the influence of a moist atmosphere, however pure this may be. Taking everything into consideration, therefore, azure blue or true cobalt blue is as stable a pigment as we can secure for our present purpose; but unfortunately it is far from being as cheap as the other three coloring agents described in earlier articles. Its insolubility in water makes it much more suitable for coloring cements than all the other blues put together, and the fact that it is scarcely acted upon by acids or alkalies in a dilute state makes it possible to prepare a blue cement for use in the vicinity of chemical works with perfect safety.

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[1] Cement Mill Section of CONCRETE, August, 1928, pages 95-96; May, 1930, pages 103-105; and June, 1930, pages 103-105.

[2] Cement Mill Section of CONCRETE, June, 1930, page 103.

Manipulating Cobalt Salts

Cobalt salts which are in themselves entirely unsuitable for use in the manufacture of blue cements can often be manipulated so as to render them either ideal for the purpose in view, or actually to transform them into cobalt blue itself. Owing to the high cost of cobalt and its compounds, it is often worth while exploiting refuse containing comparatively small quantities of it, whereas this would not be the case with cheap pigments such as ferric oxide. The main object of manipulation is either to get the cobalt into a completely soluble state so that insoluble cobalt oxide or hydroxide may be precipitated for subsequent calcination with alúmina; or conversely, to prepare an insoluble cobalt compound which when mixed with alum can be precipitated by carbonates, or again which will be precipitated by means of a soluble phosphate, in each instance calcination taking place to develop the color. In view of these details cement makers should give the most careful attention to the chemistry of the subject before they reject any cheap cobalt-containing substance as being entirely outside their scope.

Unexploited Sources of the Blue Coloring Agent

While eight unexploited sources of barium chrome coloring agent were indicated in a previous article,[3] it is necessary in the present one to cover no less than twenty unexploited sources of cobalt blue coloring agents. While the following are probably the most readily accessible of all, cement manufacturers must not conclude that these are the only ones, as this is very far from being the case. They should always keep a careful lookout, therefore, for others, as the number of soluble and insoluble substances containing cobalt which are suitable directly or indirectly for the preparation of azure blue might easily be quadrupled if space were at disposal for commenting upon them.

The following is my list of the twenty unexploited sources of cobalt blue which should receive first consideration: Argento-cobaltic ore dross, arsenical cobaltic ore residues, black earthy cobalt offal, cobalt bloom waste, cobalt chloride liquors, cobalt glance mine culm, cobalt nitrate solutions, cobalt phosphate residues, cobalt pyrites refuse, cobalt yellow residual liquors, cobaltine or cobaltite refuse and residues, electrolytic waste liquors, erythrite ore refuse, linnaeite residues, skutterudite (cobalt triarsenide) refuse, smaltite ore offal, spoiled sympathetic ink solutions, tin white cobalt tip refuse, varnish dryers' residues, waste ceramic solutions of cobalt.

Most of these substances possess little if any blue color to start with. Some are black, some are pink, others are a tin grey or white, others are so full of dirt or earthy gangue that it is difficult to state what their real color is. While it is claimed that the liquids are the most easy to manipulate, this seldom proves to be the case in actual practice. Cement makers should, therefore, not be unduly keen on purchasing waste liquors, however cheaply they may be offered to them, as analysis may prove that these contain only a very small quantity of soluble or sparingly soluble cobalt in solution or suspension.

Manufacturing Methods

As will be gathered, therefore, each of the above unexploited sources of blue coloring agents requires a certain amount of manipulation, and the main details only are summarized, as was done in the case of all the other colors previously described. With a comparatively expensive metal like cobalt several steps which it would not be worth while taking in the case of cheap materials can be arranged for, with confidence that the balance will be on the right side. What may seem to be elaborate methods in the account which follows are really much simpler than they look; and this need not, therefore, put cement men off exploiting low grade cobalt dross. I am assuming that cement men will have some general knowledge in regard to the precipitation and separation of sparingly soluble salts from their aqueous or acid solutions, as this is nearly always necessary in the case of the preparation of azure blue. However, those who require a detailed discussion alike of the theory and practice of such manufacture should consult advanced treatises on inorganic chemistry.

Argento-Cobaltic Ore Dross. This is a solid substance which proves excellent as one of the starting points for cobalt blue. It is very complicated in composition and usually contains some silver.

Cement men should fuse it with a flux in order to reduce the amount of silica and iron present, and should then calcine the fused mass in an oxidizing atmosphere, following which it should be ground and dissolved in nitric acid. After filtering off insoluble matter the silver can readily be precipitated by means of salt, and a second filtering is then called for. Following this, precipitate the iron with lime and again filter. If copper is present with heavy metals, sulphureted hydrogen should be pumped through, and insoluble sulphides filtered off again. After this the cobalt oxide can be precipitated by means of chloride of lime; and after washing this, add freshly precipitated alumina, and calcine the combination at redness. The final steps consist of washing the cinder, grinding in water, drying and regrinding.

Arsenical Cobaltic Ore Residues. These are rather troublesome to exploit successfully as a source of cobalt blue; but as they are rather abundant, cement men should not overlook them. The first step consists of concentrating the refuse on an endless band arrangement, throwing off all doubtful pieces as well as lumps of gangue. The second step consists of roasting in an oxidizing atmosphere in order to get rid of a large quantity of the arsenic. Following this, grind the roasted mass, and dissolve it in hydrochloric acid, filtering off all sparingly soluble impurities forthwith. From this solution further impurities can be precipitated by the addition of low grade calcium hypochlorite, and these again are removed by mechanical filtering. The next step consists of pumping hydrogen sulphide into the liquor, and a further filtering enables other impurities to be got rid of.

Cement men should next add small quantities of the purest chloride of lime they can get, until a precipitate ceases to be produced. This should be allowed to settle, and the solution decanted away. The precipitate should then be washed and mixed with recently precipitated aluminum oxide, and the combination of the two calcined until a color develops. The final steps again consist of washing the cinder, grinding under water, drying at a moderate temperature, and regrinding.

Black Earthy Cobalt Offal. This consists of a complex mixture of cobalt, manganese, etc., combined with oxygen, and hydrated. Cement men should not, however, despise it, as with proper manipulation a very good form of cobalt blue can be obtained from it. The main steps consist of concentrating the earthy refuse on an endless band arrangement, throwing all the worst lumps out, and grinding the best to a coarse powder. This dust should then be extracted with ferrous sulphate which is free from ferric sulphate, all insoluble impurities being separated by means of mechanical filtering. The copper, if any is present, should be precipitated next by means of sulphureted hydrogen; and after filtering this away, sodium sulphide should be added to obtain a mixture of precipitates, from which manganese can be extracted readily by means of ferric chloride. This leaves us with a precipitate of impure cobalt sulphide, which if roasted in an oxidizing atmosphere is readily transformed into cobalt sulphate or more accurately into cobaltous sulphate, there being two series of cobalt compounds. After purifying this by recrystallization, taking advantage of its solubility in water, the cobalt sulphate can be exploited as a source of azure blue, in the same manner as that described farther on when speaking of waste ceramic solutions of cobalt.

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[3] Cement Mill Section of CONCRETE, June, 1930, pages 103-105.

Cobalt Bloom Waste. This material is very similar to erythrite ore refuse. A good type of cobalt blue may be obtained from it, however, quite easily without going through many elaborate steps, and cement men are recommended, therefore, to buy parcels of it if they can get them very cheaply. The main manufacturing methods consist of passing it along an endless band in order to get rid of the worst of the impurities, following which the concentrated bloom should be ground and dissolved in hydrochloric acid, impurities of a sparingly soluble nature being filtered off. This cobaltous chloride solution should be evaporated to dryness and purified by recrystallization, following which redissolve it in water, and add alum solution. To this combined liquor sodium carbonate crystals should be added in order to precipitate the cobalt and alumina together. This mud should be well washed, dried carefully, and calcined until the blue color develops satisfactorily, following which the cinder should be well washed, ground under water, dried, and reground.

Cobalt Chloride Liquors. From time to time cement men will be offered dilute cobalt chloride liquors, which the original users do not consider it worth while manipulating further. These can easily be exploited as a rule. The first step consists of filtering them to remove sparingly soluble impurities, following which they should be concentrated until their bulk is reduced by half, multiple evaporating pans being employed for this purpose, and refiltered. Further concentration may again be necessary, but as a rule direct precipitation by ammonia gas in an atmosphere of nitrogen can then be carried out, in order to get cobalt oxide, which should be washed well. This is then mixed with recently precipitated aluminum oxide and calcined therewith at redness. The color is ground when cold under water, this being better than grinding it dry, and subsequently the fine pigment is allowed to settle, water is decanted off, and the mud dried and ground again.

Cobalt Glance Mine Culm. This material consists essentially of cobalt sulpharsenide, as cement men will expect from its name, but actually a very big quantity of other impurities is usually present.

In some instances, and indeed in probably the majority of cases, severe concentration on endless bands is necessary, following which the best samples are roasted in order to reduce the content of sulphur and arsenic alike. The roasted refuse should then be ground, and suspended in water into which fresh ferrous sulphate is introduced. Impurities will sink to the bottom, and the clear liquor can be decanted, or impurities separated by the use of mechanical filters. The solution free from suspended matter should then be precipitated with sodium sulphide if copper is absent, and this precipitate should be roasted if manganese is absent in order to obtain sulphate. By means of double decomposition with calcium chloride, cobalt chloride is obtained, sparingly soluble calcium sulphate being filtered off. To this chloride liquor alum should be added, following which precipitate the cobalt and alumina together by means of sodium carbonate. After washing the precipitate well, it should be calcined until the blue color develops properly, washed again, ground under water, and dried.

Cobalt Nitrate Solutions. Small quantities of these can sometimes be picked up by cement men who are on the lookout for cheap, unexploited sources of cobalt. They should at once be filtered to remove sparingly soluble impurities, and evaporated to reduce their bulk, following which a second filtration should take place. When impurities have again been removed the liquors should be evaporated to dryness in multiple pans, and about four times the volume of the solid which remains should be calculated, and alum added to this amount. The mixture of the two should then at once be redissolved in water, and the cobalt and alumina precipitated together by means of washing soda. Subsequently the precipitate should be very thoroughly washed, and after slow drying should be calcined at redness along with a small quantity of silvine, until the blue color develops to a satisfactory extent. This pigment should then be ground under water, washed again, dried, and reground.

An important alternative method may be mentioned, as it will appeal to a good many cement men. The nitrate solution should be evaporated in multiple pans to decrease its bulk, after sparingly soluble impurities have been filtered off, and sodium phosphate solution should be added. The precipitated cobalt phosphate should be well washed, and about five times the volume of this of freshly precipitated alumina should be added. Dry the two together, and calcine at redness for a comparatively short time, say half an hour or so, following which the blue pigment should be ground in water, washed again, dried, and reground.

Cobalt Phosphate Residues. Large parcels of these will not be available as a rule for exploitation as a source of cement makers' coloring agents, but small parcels are quite worth while dealing with, and can in most instances be readily manipulated.

Cement men will find that they get the best results if they wash these cobalt phosphate residues with ordinary water, and then straightaway add to them about five times their own volume of recently precipitated aluminum oxide. Very careful drying is then necessary, and calcination at redness for a short time only—that is, about the same as that just given in the alternative method for cobalt nitrate is necessary—until the tint develops sufficiently. Take particular care, however, to exclude gases of a reducing nature. Otherwise the color will be spoiled. The pigment should then be washed, ground under water, dried, reground if necessary again under water, dried a second time and then so finely pulverized that an impalpable powder is produced.

Cobalt Pyrites Refuse. In mining districts comparatively large parcels of cobalt pyrites refuse can sometimes be picked up, this consisting of a combination of cobalt and excess of sulphur, with various cupreous and other impurities.

The material should be passed along an endless band in order to concentrate it, and should then be roasted in order to reduce its sulphur content, and to form cobalt sulphate, which should be extracted by suspending the ground mass in water. After filtering off earthy substances which are not wanted, washing soda should be added in order to throw the iron down. Then a second filtration should take place, following which hydrogen sulphide should be pumped through in order to throw copper down, etc. After filtering this off the liquor should be boiled, and sodium hypochlorite added to throw down cobalt oxide, which should be well washed several times. Following this, mix the cobalt oxide with recently precipitated alumina, as already described, and fuse the two with a small quantity of silvine at a temperature of about 1100 deg. C. When the color has fully developed, the pigment should be carefully cooled, washed well, ground under water, dried slowly, and further ground.

Cobalt Yellow Residual Liquors. The composition of these is subject to some considerable variation. They may consist of dilute solutions of cobaltous chloride; secondly, of similar solutions of cobaltous sulphate; and lastly, they may and frequently do contain small quantities of cobaltous nitrate.

Cement men will find that acetic acid is frequently present, and if this is so, it should be neutralized by means of cobaltous hydroxide, carbonate, etc. The liquor should be filtered, and evaporated, refiltering to remove sparingly soluble impurities, and they should then be exploited as a source of azure blue in the manner already described when speaking of Cobalt Chloride Liquors, Cobalt Nitrate Solutions, and also in the manner to be described directly, when speaking of Waste Ceramic Solutions of Cobalt.

Cobaltine or Cobaltite Refuse and Residues. This consists essentially of cobalt sulphide and cobalt arsenide, but many unwanted impurities may also be present. Concentration on an endless band arrangement is the first and most important step. The second step is to pulverize the cobaltine or cobaltite offal, until quite a fine powder is produced. This powder should be thrown into vats containing nitric acid, and sparingly soluble impurities should be filtered off after the solution has been warmed.

Quite a quantity of sulphur will separate by this means, and some more may be thrown out during evaporation, which should be to dryness eventually, though it may have to be interrupted by filtration. The crude cobalt nitrate should be purified by recrystallization, and redissolved in ordinary water. Alum is then added, and a mixture of cobalt oxide and alumina is precipitated by the addition of sodium carbonate crystals. This is then washed, dried, calcined until the color develops, ground again under water after cooling, and dried, and reground.

Electrolytic Waste Liquors. These as a rule consist of dilute solutions of cobalt ammonium sulphate with various unwanted impurities. Put them straightway through mechanical filters. Following this they should be evaporated to dryness in multiple pans, either right away, or in intermittent stages to allow of further filterings being given to get rid of material which separates out. The double sulphate should then be heated in order to drive off ammonia, and what remains should be redissolved in water, and the cobalt should be precipitated by means of carbonate of soda. This should then be well washed, and recently precipitated alumina added, the combination of the two being calcined at redness as before, until the blue develops satisfactorily, following which the pigment should be ground, washed, dried, and reground.

Erythrite Ore Refuse. This is not as difficult to exploit as a source of azure blue as some of the other materials dealt with and to be dealt with. Concentrate it on an endless band arrangement, picking out as far as possible all lumps of earthy gangue. Owing to the fact that the remainder is usually quite moist in character it should be dried at 100 deg. C. before any further treatment whatever is given it. The next step consists of roasting it in an oxidizing atmosphere in order to get rid of the arsenic as completely as possible, following which it should be ground and dissolved in hydrochloric acid, sulphuric acid, or nitric acid, whichever is most convenient. After these liquors have been filtered, the solution should be evaporated to dryness, and redissolved. If the sulphate is obtained this should be exploited as described later under Waste Ceramic Solutions of Cobalt, while in the case of the nitrate or chloride, alum should be added, and a combination of precipitates of cobalt and alumina should be obtained by precipitation with washing soda. These should be filtered off, well washed and dried, and silvine added, prior to calcination until the blue color develops to a satisfactory extent. The subsequent steps consist of washing, drying, and grinding.

Linnaeite Residues. These as a rule are not very large in amount, but are well worth exploiting if they are cheap.

Concentrate them on an endless band in order to remove the grosser earthy impurities, and then roast the lumps in air. Following this the roasted mass should be ground and dissolved in sulphuric acid, impurities being filtered off. Ammonia alum and magnesium sulphate should be added, prior to evaporation to dryness, the mixture of crystals then being melted, and calcined until the color develops to a satisfactory extent. The pigment should be carefully cooled, well washed, ground, and carefully dried.

Skutterudite Refuse. Essentially this consists of cobalt triarsenide, but as cement men will soon find out on examining samples of it, there is in most samples far more dirt than arsenide present. It is usual, therefore, to concentrate the refuse on an endless band arrangement, and then to roast the best portions in air, in order to oxidize the arsenic present, and to produce cobalt monoxide. This lumpy material should next be ground, and the powder should be treated with nitric acid, insoluble impurities being filtered off.

To the filtrate mix an alum solution, and then precipitate the cobalt along with alumina by means of washing soda in the manner already described. This complex mixture of precipitates should be well washed, and calcined either alone or with silvine, until the blue color develops to a satisfactory extent, following which it should be carefully cooled, ground, washed, dried, and again ground.

Smaltite Ore Offal. Considerable quantities of this can sometimes be picked up, but all too often it is extremely dirty. The first step is always to concentrate it on an endless band so that lumps which consist solely of gangue can be got rid of. Then roast it in an oxidizing atmosphere in order to get rid of arsenic pretty completely, and test small samples of the ground powder after the roasting for the presence of iron and nickel, which if present must be got rid of or separated in the elaborate ways described in textbooks. Assuming, however, that your sample of smaltite ore offal is free from both, the powder can at once be treated with hydrochloric, nitric, or sulphuric acid, in order to get the cobalt into solution, after which we can proceed in the same manner as that already described in the case of cobalt chloride, cobaltous nitrate, and in the manner to be described directly for colbaltous sulphate under Waste Ceramic Solutions of Cobalt.

Spoiled Sympathetic Ink Solutions. Essentially these consist of dilute liquors containing cobaltous acetate, and cement men will not have much difficulty in exploiting them as a source of azure blue. The first step is to filter off sparingly soluble impurities, after which the liquors should be introduced into multiple evaporating pans, and evaporated to dryness. Purification by recrystallization is sometimes specified, but in practice for the preparation of cement makers' coloring agents it is not necessary. The acetate should then be heated, therefore, in order to break it up, and to produce either a carbonate or a mixture of carbonate and oxide. This last should then at once be dissolved in hydrochloric acid, and azure blue obtained from it in the same manner as that already described when speaking of cobalt chloride liquors.

Tin White Cobalt Tip Refuse. This residue consists mainly of arsenides of cobalt, nickel, iron, and copper, but with small quantities of other metals present as well. There is a large amount of dirt present, and the first step is to pass the tip refuse along an endless band, so that all pieces of obvious gangue can be thrown out.

Next roast the concentrated refuse in order to remove arsenic, and grind the remainder until a coarse powder is produced. If this is suspended in vats containing water, ferrous sulphate solution will dissolve out of it most of the metals that are of use and leave those unwanted in a silt which sinks to the bottom. This step should accordingly be taken. Filter after digestion has taken place.

From the filtrate the copper should be precipitated by means of sulphureted hydrogen, and a second filtration must then immediately be arranged for. From this second filtrate it will be easy to precipitate a mixture of cobalt, nickel, and manganese sulphides by means of sodium sulphide, and when this has been done, the supernatant liquor should be decanted off. From the sludge the manganese can be extracted by means of ferric chloride and a second decantation or filtration should then be arranged for, the remaining precipitate being well washed.

If this is now roasted in air, a mixture of sulphates is produced. This should be dissolved in water and filtered, and to a portion of it only lime water should be added, this liquor then being oxidized by the introduction of chlorine gas, prior to being added to the second portion. The net result of these operations is to obtain a precipitate of cobalt oxide free from nickel, and this can be filtered off, well washed, heated with precipitated alumina with or without silvine as before, until the blue color develops, and then washed, ground, and dried.

Varnish Dryers' Residues. Cement men who operate in the vicinity of varnish works should buy up all cobaltous residues produced by these firms, as frequently they are cheap and easy to exploit. Essentially they consist of cobaltous linoleate, oleate, oleo-resinate, resinate, or a mixture of two or more of these, and are not used on account of having become spoiled or contaminated, or having begun to ferment.

The easiest way of exploiting these as a source of azure blue for coloring cements is to calcine them at once—that is, without any washing or acid treatment. This decomposes the organic acids which are combined with them, and leaves a mixture of carbonate and oxide, or carbonate alone. This should then at once be dissolved in nitric acid and filtered, after which the solution can be exploited as a source of azure blue in the manner already described when speaking of Cobalt Nitrate Solutions.

Waste Ceramic Solutions of Cobalt. In china manufacturing districts cement men will find that they can pick up dilute solutions of this nature which essentially consist of watery liquors containing cobaltous sulphate, with more or less chinaware dust in suspension.

The first step in exploiting these as a source of cobalt blue consists of filtering them, and this is not as easy as it sounds. Very considerable care should, however, be taken by repeated passage through fine filtering mediums to remove all china dust, and this is sometimes facilitated by warming the liquors and then suddenly cooling them. Following filtering, the liquid should be evaporated and refiltered two or three times, as further impurities may become less soluble during the evaporation of them. Finally, the liquor should be evaporated to dryness in multiple evaporating pans, in order to obtain cobaltous sulphate, which can if necessary be purified by recrystallization from distilled water.

Having obtained the sulphate in as pure a state as possible, make up the following mixture:

	Parts
Cobaltous sulphate	20
Ammonia alum	100
Magnesium sulphate	1.25

This mixture should be melted and agitated until all its water of crystallization has gone off, and then calcined without further admixture, until the blue hue is dark enough. Considerable care should be taken to cool it without the introduction of any foreign gases. The pigment should finally be ground under water, well washed, dried, and again finely ground.

Proper Proportions

Regarding the proportion of azure blue or cobalt blue which can safely be mixed with cement, this, as was the case with the other colors, is subject to somewhat wide variation owing to the comparative inertness of this very valuable pigment. Blue cements which contain a relatively small quantity of this coloring agent can be marketed at a far cheaper rate than those containing large amounts, as the cost of cobalt blue is very substantial. As I have already pointed out in several previous articles, if one is using a deeply colored cement considerably more cement has to be employed in order to secure a satisfactory set. This is less pronounced in the case of blue cements than with some, as the actual quantity of the pigment is rather less. Cement men must, however, always keep in view, especially in using the darkest blues of all, that a large quantity of a foreign substance entirely without setting properties is present. If too much color is used the strength of the concrete will be considerably less than when an uncolored cement was employed. Comparatively speaking, cobalt blue prepared from the above unexploited sources will be much cheaper than that obtained by other means, and cement firms will not find in the majority of cases that they have to sell blue cements with a very narrow margin of profit. As was the case with the other colored cements, customers can easily be persuaded that a blue cement, being so much more attractive than a grey one, is well worth the additional price which has to be asked for it.

Suitable proportions for three shades of blue cement are given below:

PALE BLUE CEMENT

	Parts
Cement	930
Azure blue	70

Mix the two materials very thoroughly together in a dry state before sale, as hasty mixing is almost certain to give a streaky effect.

MEDIUM BLUE CEMENT

This is the best formula for general use, and has been extensively employed in Europe for some considerable time:

	Parts
Cement	860
Azure blue	140

Mix the cement with the blue extremely thoroughly as before, and be unusually particular to obtain the color from your manufacturing shed in a perfectly dry state.

DARK BLUE CEMENT

The tint of this is unusually pleasing, but it is an extravagant mixture to use, because if the concrete or cement mortar is to set satisfactorily, the quantity of colored cement must be 20 per cent greater than if uncolored cement is employed. In order to cover the cost of the pigment a very much higher price will have to be asked for it than for cement of a pale blue hue:

	Parts
Cement	790
Azure blue	210

If there is any fear at all of the cobalt blue or azure blue not being perfectly dry, it should be warmed immediately before being mixed with the cement, and the two should be mechanically incorporated over an unusually prolonged period. Otherwise streaks are certain to appear when the cement is employed. With a big quantity of pigment present such as this, the time usually allowed for mixing should be doubled.

In future articles I shall discuss the preparation of cements of several shades of two other colors. In every instance, as also in the previous ones, unexploited sources of the coloring agents are available, even in the case of the compound ones, and the simple manipulation which these require is in no case beyond the scope of the average up-to-date cement manufacturer.

Regional Meetings Held at San Francisco and Ogden, Utah; Southwestern Trophy Dedicated

One of the recent western regional safety meetings sponsored by the Portland Cement Association was that held at the Bigelow Hotel, Ogden, Utah, on September 25.

One of its features was the round table discussion of mill safety problems in each department, at the afternoon session.

Among the papers on the program and presented at the third Pacific Coast regional safety meeting and first aid contest held September 16 at the Palace Hotel, San Francisco, Calif., was one by C. F. Fry, superintendent of safety, industrial accident commission of the state, on "Plant Safety Organization," and another on "Underground Mining," by Robert A. Kinzie, mining engineer, consulting engineer of the Santa Cruz company.

These papers were presented at the morning session, when A. J. R. Curtis of the Portland Cement Association, also delivered an address. The first aid competition took place in the afternoon, and was followed by the safety dinner and rally.

Dedication of the safety trophy presented to the Southwestern Portland Cement Company plant at Victorville, Calif., took place on September 20.

M. A. Koffman presided, introducing A. J. R. Curtis of the Portland Cement Association, who presented the trophy. It was formally acknowledged by Wm. Montgomery.

Another of the speakers was H. G. Jacobsen, formerly manager of the accident prevention bureau of the association, and a pioneer in safety work.

Emil Stroh, president and treasurer, presided at the dedication of the trophy awarded to the Osborn, Ohio, plant of the Wabash Portland Cement Company, on October 1st. J. B. Johns presented the trophy.

Alpha 1930 Earnings Lower

The Alpha Portland Cement Company for the 12 months ended September 30th reports a net income of $1,280,017 after depreciation and federal taxes, equal to $1.60 a share on the 711,000 shares of common stock against $1,989,345, or $2.60 a share in the preceding twelve months.

Selecting Coal on Basis of Ash Analysis

Uniform Ash Content Necessary to Maintain Uniform Composition and Physical Properties of Clinker—High Ash Content Not Necessarily Objectionable

The need for uniform ash content in pulverized coal for use in burning clinker is explained by A. E. Hiscox, superintendent and chief chemist, West Penn Cement Co., West Winfield, Pa., in the September (1930) issue of West Penn Safety News. The paragraphs that follow are extracted from the article.

As the pulverized coal enters the kiln and ignites, the ash particles in the coal are either carried out the stack or else drop among the materials coming down the kiln. In the ordinary types of kilns, especially the older ones, from 25 to 50 per cent of this ash contaminated the clinker. In the kilns at West Penn, with their chain systems, this contamination ranges from 70 to 85 per cent, and is of such quantity that the raw mix must be calculated very closely to offset it. The laboratory had an amusing experience with this excessive contamination when the mill was started in March of 1927. Several thousand barrels of slurry were corrected before the kiln started, based on the usual ash contamination. Within a few hours after the kiln was in operation the error was readily seen and the entire storage of slurry had to be corrected again.

Coal ash is essentially shale in its composition and to take care of this addition it is necessary to add extra limestone when the raw mix is calculated and corrected. It is necessary to have a uniform ash content in the coal. The reason is apparent. If we add a definite amount of limestone to balance the ash contamination and this ash content varies widely, the resulting clinker will show variations in composition and physical properties.

With heavy contamination from coal ash it is sometimes advisable to select a coal purely on the basis of the analysis of the ash. For instance, an ash might run very high in alumina content, when an increase in the alumina of the finished cement was not desired; or the iron oxide content might be either too high or too low. We tried out one coal at this mill of an ash content of about 18 per cent. Under certain conditions this low grade coal might have been utilized but the ash itself was of such an undesirable composition that the coal had to be rejected for use.

The selection and preparation of the coal is therefore an operation requiring the same care and attention that other phases of the process demand.

Calaveras Adds 1,000 Acres to Limestone Holdings

The purchase of a large limestone deposit at Jesus Maria in the Mokelumne Hill district, by the Calaveras Cement Company, was disclosed by a deed recorded at the request of the company. The land totals over 1,030 acres. The deed was dated March 29, 1929, but was not made public until presented for recording.

With the acquisition of the tract, the company has acquired practically all the limestone belt through central Calaveras County. The latest purchase lies over 20 miles away from the San Andreas plant, but is a continuation of older holdings.

Lone Star Plant Closed During October

The Lone Star Cement Company plant at New Orleans, Louisiana, was shut down during October, the shipping department only remaining open.

EDITORIAL

The Cement Industry Needs a War Chest

BEGINNING of construction of a large, new cement mill in the southwest is said to be scheduled for January 1st. Two separate groups in a single southern state are active in the promotion of new cement mills, though it is not yet known with what degree of success. In Mexico three small mills are actually under construction.

But even if not another cement mill were erected within the confines of the North American continent, even if not a single rotary kiln were added to existing installations, production capacity would increase.

This is due to the many modernizing installations now going into existing mills. These installations have as their chief purpose the lowering of unit production costs. To cite only a few examples, the installation of slurry filters, dust collection systems, new grinding methods or new kiln feeders, is primarily to reduce cost. Yet all, to a greater or less degree, increase productive capacity.

If it is admitted that production capacity will increase even if no more mills are built and no additional kilns are installed, it must likewise be reasoned that the industry must find some way to increase the annual consumption of portland cement.

This increase in consumption must be obtained in the face of much stiffer competition than formerly existed. Trade associations that are carrying on the research and promotional activities of industries making rival construction materials are much better organized than they formerly were, and they are served by a better trained personnel.

The only way in which the portland cement industry can hope to increase the consumption of its product, or even to hold consumption up to its present volume, is through a counter-offensive. This should not be a counter-offensive of the kind that attempts to discredit other materials—other trade associations do enough of that—but the offensive should be directed toward arousing a consciousness of the value of concrete and cement in places where it is not now being used.

There must be a sustained effort to remove unfair restrictions against concrete and concrete products in antiquated building codes, and to keep in touch with the development of new building codes.

The vast construction programs of railways and other public service corporations have room for more concrete in their structures. Concrete highways need help to hold their present commanding position.

All these, and a host of other possibilities, cannot be promoted without funds. Offensives cannot be conducted without war chests. Neither can the promotion of more and better concrete reach its full success unless the entire industry takes part in this offensive, and unless all are driving toward the same objective.

More Friendly Interest in Home Industries

EVEN the man in the street is now willing to admit that orders for home industries mean jobs for the unemployed of his home community.

This present attitude, so different from the devil-may-care attitude of 1928 and 1929, is reflected in the newspapers. Recently several newspapers criticized the highway department of their state because 25 per cent of 1930 road contracts had been awarded to contractors outside the state. Some newspapers criticized the South Carolina highway department for inviting bids from foreign cement manufacturers.

At least one cement company that operates largely within one state has told newspaper readers some outstanding facts about itself. For instance, its annual payroll runs well above half a million dollars. It spends nearly as much for coal, bought from mines within the state, and a larger amount for other purchases from home concerns.

At present these facts have news value. Individual cement companies, and the industry as a whole, may improve their relations with the public through the judicious broadcasting of similar facts, now that newspapers are in a mood to print them.

Moreover, while millions are out of work things can be made uncomfortable for the public official whose distorted conception of his duty to the taxpayer leads him to buy foreign-made cement.

The Passing of Richard K. Meade

IN the death of Richard K. Meade on October 13th, mentioned on another page of this issue, portland cement loses one of the brilliant men of the industry.

As long ago as 1901 Mr. Meade presented the infant American cement industry with a manual on methods of chemical analysis and physical examination of portland cement.

Since that time he has continued his close affiliation with the industry through his consulting engineering practice and the publication of other books and articles dealing with the manufacture of portland cement. For years he has held a place as one of the foremost American authorities on cement.

The regret over the passing of Mr. Meade is tempered by realization of the great service he has rendered.

Can Southern Mississippi Valley Support More Plants?

In the October issue, page 92, was printed a news item concerning a new cement mill proposed for construction at Vicksburg, Mississippi.

By reason of the fact that no cement plant is now located in Mississippi, the deduction might follow that the site suggested would be peculiarly attractive to the manufacture of cement. However, a cursory glance at the government figures on capacity and consumption in the southeast, and more especially in the states surrounding Mississippi, would indicate that quite the reverse is true.

Cement can be economically shipped into the State of Mississippi from the cement plants in operation in Alabama, Tennessee, Arkansas and Louisiana. The capacity figures given below are those reported by the various companies located in these states in cement manuals and financial reports. The consumption figures are taken directly from the reports of the U. S. Bureau of Mines.

States	Capacity	1929 Consumption	Excess Productive Capacity
Alabama	11,469,000	1,953,154	9,515,846
Tennessee	6,640,000	3,161,115	3,478,885
Arkansas	1,600,000	1,512,867	87,133
Louisiana	1,000,000	1,678,051	—678,051
Mississippi	————	1,022,085	—1,022,085
	20,709,000	9,327,272	[1]11,381,728

[1] Sum of last two amounts deducted from sum of first three.

From the result shown by this table it is quite apparent that the potential capacity of the cement plants located in the states surrounding Mississippi is around eleven million barrels in excess of the actual consumption of the maximum area of distribution from a Mississippi plant, which area embraces the whole of Alabama, Tennessee, Arkansas, Louisiana and Mississippi.

It is extremely difficult, therefore, to understand how there is any room for additional cement capacity in an area that is already so greatly over-supplied.

Volume of Combustion Chamber for Burning Pulverized Coal

Chart Based on 80 Per Cent Boiler Efficiency—Illustrative Example Given

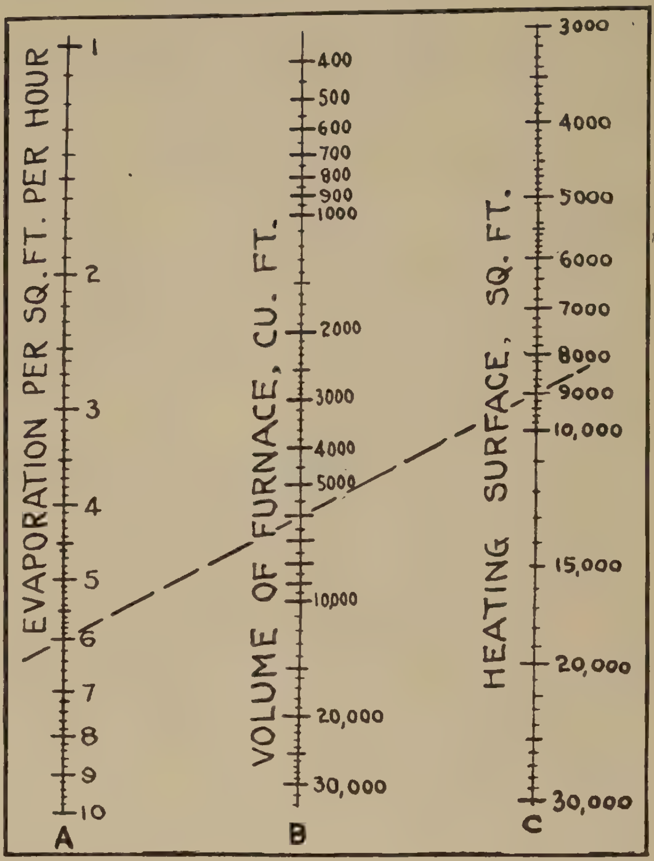
By W. F. SCHAPHORST, M. E.

In connection with the rapidly increasing use of pulverized coal, a question that must be answered frequently today is this: "What shall be the volume of the combustion chamber for the burning of pulverized coal?"

Herewith is a chart which answers that question. Simply run a straight line from the correct evaporation figure, Column A, to the number of square feet of heating surface in the boiler, Column C, and the volume of the combustion chamber or furnace in cubic feet in Column B is immediately given.

For example, the dotted line drawn across this chart shows that if the evaporation per square foot of heating surface is 6 pounds per hour and if there are 9,000 square feet of heating surface in the boiler the volume of the combustion chamber must be 6,000 cu. ft. The chart is based on a boiler efficiency of 80 per cent.

The chart will handle any boiler of any size. Thus if the heating surface were 90,000 sq. ft. instead of 9,000 the same dotted line across the chart shows that the volume of the furnace must be 60,000 cu. ft. instead of 6,000. In other words, if it is necessary to add a cipher in Column C, simply add a cipher in Column B. Or if it is necessary to add a cipher or digit in Column A likewise add a cipher or digit in Column B.



Opposition to Proposed New British Cement Works

The British Health Ministry is holding an inquiry into an appeal by Frank Cooper (Canterbury), Ltd., against the refusal of Canterbury City Council to grant permission for the erection of a cement works in the southern part of the city.

As early as January, 1929, the cement company began to dig the foundations, and considerable progress had been made in preparing for the subsequent erection of the buildings before July 29, when the application for a permit under the town-planning scheme was made. The manager of the company had not appreciated what he had to do in the matter of getting permits, but as soon as he did so he submitted plans for approval.

W. H. Woodcock, analytical chemist, said there must be a certain amount of dust from the proposed cement works. Under certain conditions there would, he declared, be imperfect combustion, and carbon monoxide would be given off which would be dangerous to health within a certain distance. The emission of carbon dioxide would not injure the surrounding orchards, but dust might be injurious.

W. D. Caroe, architect to the cathedral for 30 years, said that nearly $500,000 had been spent on work in connection with decayed stone during that time. He attributed it to atmospheric pollution—carbon dioxide and sulphurous fumes.

The Chemistry of Portland Cement Manufacture

How Clinker Absorbs Sulphur from Waste Gases in Passage Through Kiln—Effect of Burning with Reducing and Oxidizing Flames Compared—Cements Containing Sulphides Have Greater Expansions and Lower Strengths than Others—Data from Three Cement Plants

III—Effect of Sulphur (S) and Its Compounds

Part Two

By **ALTON J. BLANK**
General Superintendent and Supervising Chemist, Compania de Cemento Portland "Landa," S. A., Puebla, Puebla, Mexico

This is the third article of this series on problems involving the chemistry of portland cement manufacture. This installment comprises Part Two of the author's discussion of the effect on sulphur and its compounds. Results of investigations covering a period of several years in each of three cement mills are given.—The Editors.

IN the burning of portland cement clinker in the rotary kiln, the amount of raw and partially calcined mixture carried out of the kiln by the waste gases may be as low as 3 per cent to as high as 12 per cent of the total amount of material fed into the kiln. In the dry process of manufacture the more important factors affecting the quantity of dust carried out of the kiln by the waste gases are as follows:

(1) Length and diameter of kiln.
(2) Diameter of opening at feed end of kiln.
(3) Speed at which kiln is rotated.
(4) Condition of coating which adheres to the brick lining.
(5) Ring formations.
(6) Quantity of material fed to kiln.
(7) Specific gravity of raw mixtures and fineness to which they have been ground.
(8) Draught.

Sulphur Present in Flue Dust

In the burning of portland cement clinker in the rotary kiln the quantity of sulphur present in the flue dust carried out of the kiln by the waste gases and deposited in the dust chambers may be as low as 2 per cent or as high as 35 per cent when determined as sulphur trioxide (SO_3). The more important factors affecting the quantity of sulphur present in the flue dust are as follows:

(1) Amount of sulphur present in the raw cement mixtures.
(2) Amount of sulphur present in the fuel.
(3) Atmosphere and temperature prevailing in the kiln.
(4) Affinity of the materials in the kiln for the absorption of sulphur from the gases.
(5) Rate of precipitation of sulphur from the waste gases at the cool section of the kiln and at the lower temperatures prevailing in the dust chambers.

Data at Plant No. 1

Tests carried out upon 10 by 150-ft. dry process kilns operating in connection with specially designed dust chambers 40 ft. in length showed that 8 per cent of the total amount of raw mixture fed to the kilns was carried out of the kilns by the waste gases. Of the 8 per cent of mixture carried out of the kilns, 4 per cent was collected in the dust chambers and returned to the kilns, while the remaining 4 per cent of the mixture was present in the gases carried out of the stacks.

The raw materials at the plant in question were free of sulphur in any of its forms. The kiln fuel consisted of powdered coal, the ultimate analysis of which revealed approximately 1 per cent of sulphur, while chemical analysis of the coal ash showed sulphur to be present to the extent of 4.63 per cent as SO_3. The ash content of the coal averaged 12 per cent.

Analysis of raw mixtures, coal and clinker, as made over a period of two and one-half years, showed that around 40 per cent of the coal ash combined with the clinker in the kiln. Since an average of 125 pounds of coal were burned per barrel of clinker produced, certain changes in the initial raw mixtures were necessary to offset the change in composition of the clinker which was brought about through contamination with the coal ash.

Analysis of the flue dust collected in the kiln dust chambers showed the average dust as returned to the kiln to contain 3.5 per cent of sulphur as SO_3. Analysis of the average clinker showed 0.43 per cent of sulphur as SO_3.

Waste gas analysis made daily on the kilns showed an oxidizing atmosphere to be practically always present in the kiln, while tests performed daily on the clinker failed to reveal the presence of sulphur as sulphide.

Conclusions would be to the end that, where a small part of the sulphur present in the average clinker was due to the coal ash contamination, the greater part of the sulphur present in the clinker was due to the absorption of sulphur from the waste gases by the materials in their passage through the kiln.

Data at Plant No. 2

Tests carried out upon a 6 by 70-ft. dry process kiln operating in connection with a small dust chamber showed that approximately 12 per cent of the total amount of raw mixture fed to the kiln was carried out of the kiln by the waste gases. Of the 12 per cent of mixture carried out of the kiln by the waste gases only 2 per cent was collected in the dust chamber, the remaining 10 per cent of the mixture being present in the gases carried out of the stack.

The raw materials at the plant in question showed traces of sulphur as SO_3. The kiln fuel consisted of crude oil having an average of 4.8 per cent S. Waste gas temperatures in the kiln dust chamber were between 1400 to 1600 deg. F. Waste gas analysis showed the atmosphere in the kiln to be oxidizing in character. Analysis of the flue dust collected in the kiln dust chamber showed an average of 2.4 per cent of sulphur present as SO_3, while analysis of the average clinker as discharged from the kiln showed 0.33 per cent of sulphur present as SO_3.

Utilizing the same raw mixtures and fuel oil, tests carried out upon a 6 by 130-ft. dry process kiln operating in connection with a small dust chamber, but with draught furnished by a blower, showed that of the total amount of raw mixture fed to the kiln approximately 9 per cent was carried out of the kiln by the waste gases. Of the 9 per cent of mixture carried out of the kiln by the waste gases, approximately 2 per cent was collected in the dust chamber, the remaining 7 per cent of the mixture remaining in the gases passing through the blower.

Waste gas temperatures in the kiln dust chamber were between 900 and 1300 deg. F. Waste gas analysis showed the atmosphere in the kiln to be reducing in character. Analysis of the flue dust collected in the kiln dust chamber showed the presence of an average of 4.9 per cent of sulphur (determined as SO_3 but present in part as sulphur sulphide). Analysis of the average clinker as discharged from the kiln showed the presence of 0.15 per cent of sulphur (determined as SO_3 but present in part as sulphide).

Conclusions would be that with the shorter kiln, with oxidizing atmosphere present in the kiln, a larger amount of the fuel sulphur was absorbed by the materials in their passage through the kiln, while at the higher temperatures prevailing in the kiln dust chamber the precipitation of sulphur from the waste gases was less than was experienced at the cooler temperatures prevailing in the dust chamber of the longer kiln. These results, covering a period of several years, tend to confirm the belief that burning with an oxidizing flame tends to retain a great part of the sulphur of the fuel in the clinker, while burning with a reducing flame tends to retain a smaller amount of the sulphur of the fuel in the clinker.

Tests carried out upon kilns operating by dry process, on forced draught, and in connection with a waste heat boiler system, covering a period of two and one-half years, yielded further data on the sulphur question.

Raw mixtures used at the plant in question contained an average of 0.72 per cent of sulphur as SO_3. Fuel utilized consisted of fuel oil containing an average of 5.5 per cent S. The amount of dust carried out of the kilns by the waste gases approximated 7 per cent of the total amount of mixture fed the kilns. Of the 7 per cent of mixture carried out of the kilns by the waste gases around 6 per cent was collected in kiln dust chambers and the waste heat boiler system, the remaining 1 per cent of the mixture being present in the gases passing through the blower. The sulphur content of the collected flue dust averaged 23 per cent SO_3, a part of which was usually present as sulphides. The average clinker, as discharged from the kilns, contained 0.75 per cent of sulphur determined as SO_3, though showing the presence of sulphide at times when a reducing atmosphere prevailed in the kilns.

Tests made over a period of several years on the finished cement showed those cements containing sulphides to have the greater expansions and the lower strengths. Similarly, tests made in the kilns producing clinker with both reducing and oxidizing flames showed the former product to be inferior to the latter in so far as quality was concerned. However, it is to be supposed that reduction of the iron compounds was also a contributing factor.

Some Theories Exploded

This paper, dealing with the effect of sulphur and its compounds upon portland cement manufacture and quality, has been especially prepared for those authors on cement manufacture who cling to the theory that all sulphur present in raw cement mixtures is driven off in the kiln at the high temperatures usually had; to other authors who state that the sulphur present in fuels is not absorbed by raw cement mixtures in the kiln, and particularly to those authors who state that the sulphur sulphides present occasionally in cements exert no influence upon their quality. More often than not, theory and practice disagree in portland cement manufacture.

St. Louis Portland Cement Company Plans Await Spring

No further progress in the construction of a projected plant near St. Louis by the St. Louis Portland Cement Company has been made, and plans are at a standstill until spring, according to C. Boettcher.

Announcement of the organization of the company was made in July, at which time five sites on both sides of the Mississippi river were under consideration.

National Employment Service Made Available to Cement Men

The placing of trained workers in the cement industry is the purpose of the national employment service recently put into operation by the Portland Cement Association. This is said to be the first attempt of a major manufacturing group to co-operate in establishing a clearing house for the services of its skilled employes.

To Install Range Lights at Aetna Plant

Governmental survey for the erection of range lights at the Aetna Portland Cement Company plant at Essexville, near Bay City, Mich., has been completed, and lights will shortly be installed marking the river channel after inbound vessels reach a point 1,100 ft. from the outside marker of the lighthouse in Saginaw bay.

Ideal Company Dividend

The Ideal Cement Company of Denver, Colorado, on October 1st, paid its regular dividend of 75 cents a share to stockholders of record of September 15th.

Alpha Dividend

The Alpha Portland Cement Co. recently declared quarterly dividends of 50 cents on common, payable October 25th to stockholders of record October 1st.

Drying and Pulverizing at West Penn

Coal Dried with Hot Air Drawn from Clinker Coolers—Air Separation Employed in Grinding—Coal Meters on Each Kiln

By A. E. HISCOX
Superintendent and Chief Chemist, West Penn Cement Co., West Winfield, Pa.

IN an article printed under the heading, "Powdered Coal," in the September (1930) issue of West Penn Cement Safety News, the writer has discussed the drying and pulverizing of coal, the equipment employed and results obtained. The discussion that follows is substantially in accord with the article mentioned.

Drying Coal With Heat From Clinker Coolers

For the drying of coal a Fuller-Randolph unit is used. It is a compact unit, and it utilizes the hot air drawn over from the clinker coolers.

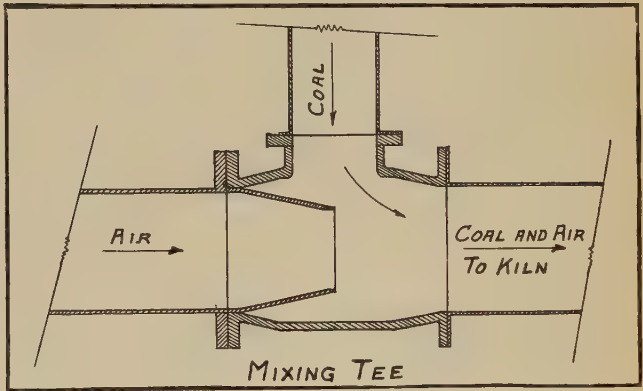
This dryer is a rectangular box, about 10 ft. square and 13 ft. high, with the bottom tapering, and containing deflectors that serve to vary the path of the coal coming down and the air passing upward. The heated air is drawn from the clinker coolers by fans, and as it is in intimate contact with the coal, the drying operation is performed very efficiently. The precaution must be taken, in any type of coal dryer, to keep the temperature of the air at a point below which combustion will start. In the Fuller-Randolph dryer the air temperature is maintained at 140 to 180 deg. F.

This temperature is controlled by recording pyrometers. Some coals will permit higher drying temperatures than others, depending upon the size of pieces and the amount of volatile matter in the material.

After drying, the coal is ready for pulverizing. There are several types of coal grinding mills in use. Some plants employ tube mills which require preliminary breaking down to 10 to 20-mesh size. The Raymond mill is used extensively, being of the roller type, and equipped with an air separator for removing the ground coal from the mill as rapidly as it is produced. This makes the use of screens unnecessary and also assures close control of the fineness. At West Penn the Fuller-Lehigh mills, which are of the ball and screen type are employed. There are two 46-in. and one 70-in. units. In the smaller size of mill, four steel balls of 12⅜ in. diameter are pushed around on a horizontal grinding ring, the pulverizing of the coal taking place between the balls and the ring. The finished coal is separated from the unground material by air and screens, the air being generated by fan blades attached to the castings of the pushers. In the 70-in. mill there are six balls of 13-in. diameter. As the coal is reduced to the desired fineness it passes through circumferential screens and is conveyed to a 4-in. Fuller-Kinyon pump which delivers the powder to storage bins at the kilns.

A 46-in. unit will reduce 4 to 4½ tons per hour to a fineness of 80 per cent passing the 200-mesh screen; a 70-in. mill will produce about 10 tons per hour at the same fineness.

There is considerable difference of opinion as to how finely coal should be ground for use in burning clinker. The more finely pulverized, the better the combustion in the kiln; but, as in many other lines of industrial activity, the factor of preparation cost creeps in and determines the fineness standard. It is possible in the West Penn kilns to secure effective combustion with coal ground to a fineness of 80 per cent passing the 200-mesh screen, and this state of fineness is therefore not exceeded.



The comsumption of coal per barrel of clinker burned is watched very carefully. When we stop to consider that, if we use 100 lbs. of coal per barrel of clinker burned, with coal costing at the mill, delivered, three dollars per ton, the unprepared fuel item alone is fifteen cents per barrel, we readily see why the amount of coal used is checked so closely.

Bailey coal meters are installed on each kiln. Each revolution of the feeder wheels in these meters delivers a definite quantity of coal and by this means we are able to tell to a pound how much fuel is consumed in properly burning one barrel of clinker. As the coal drops into the mixing tee, the sketch of which is shown, air from the primary fans is intimately mixed with it and forces the fuel into the kiln.

German Firm Acquires Control of Competitors

The Wiking Consortium, which owns the Ciments de Beckum, has acquired controlling interests in the cement firms, Societe Klasberg and Wilhelm Schlendorff, at Herne.

The Schimischow Portland Cement firm, which operates plants in Silesie and at Frauendorf, near Berlin, has declared a dividend of 15 per cent.

Cement Statistics for September

26 Per Cent Increase in Stocks for Current September Accompanied by Decreases in Production and Shipments—Production 75 Per Cent of Capacity

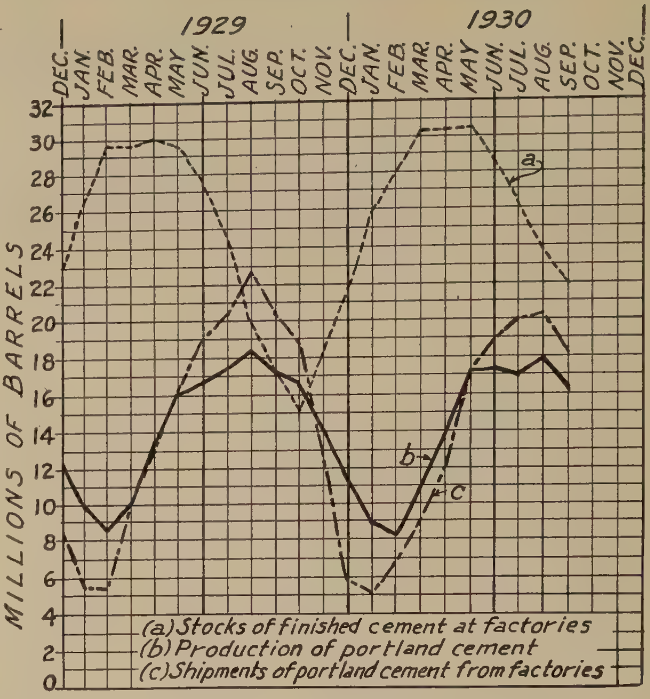
	1929	1930	Increase or Decrease (—) Per Cent
Production, September	**17,223,000**	16,124,000	—6.4
Shipments, September	**19,950,000**	18,083,000	—9.4
Stocks at end of Sept.	17,325,000	**21,864,000**	26.2
Total production for year to date	**128,199,000**	126,917,000	—1.1
Total shipments for year to date	**133,569,000**	128,673,000	—3.8
No. of plants reporting	166	166	-------

NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION, APPEARS IN SLIGHTLY HEAVIER TYPE.

Relation of Production to Capacity

(Figures represent per cent)

	–September–		August	July	June
	1929	1930	1930	1930	1930
The month	**81.8**	75.7	81.0	77.8	81.4
The 12 months ended	**67.5**	65.2	65.6	66.1	66.4



Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in September, 1929, and 1930, and Stocks in August, 1930

District	Production—September		Shipments—September		Stocks at end of month		Stocks at end of August*
	1929	1930	1929	1930	1929	1930	1930
Eastern Pa., N. J. and Md.	**3,600,000**	3,273,000	***3,924,000**	3,813,000	4,452,000	**4,969,000**	5,509,000
New York and Maine	**1,241,000**	1,238,000	1,434,000	**1,467,000**	**1,274,000**	1,069,000	1,298,000
Ohio, Western Pa. and W. Va.	**1,919,000**	1,873,000	**2,386,000**	1,984,000	2,685,000	**3,079,000**	3,190,000
Michigan	**1,519,000**	1,242,000	**1,800,000**	1,381,000	*961,000	**2,279,000**	2,418,000
Wis., Ill., Ind. and Ky.	**2,182,000**	2,171,000	**2,759,000**	2,716,000	1,740,000	**2,751,000**	3,295,000
Va., Tenn., Ala., Ga., Fla. and La.	**1,298,000**	1,198,000	**1,311,000**	1,178,000	1,610,000	**1,813,000**	1,794,000
Eastern Mo., Ia., Minn. and S. Dak.	1,670,000	**1,748,000**	**2,325,000**	2,116,000	1,426,000	**1,569,000**	1,937,000
W. Mo., Nebr., Kans., Okla. and Ark.	**1,422,000**	1,233,000	**1,542,000**	1,227,000	*798,000	**1,643,000**	1,637,000
Texas	**707,000**	679,000	***681,000**	599,000	*492,000	**707,000**	627,000
Colo., Mont., Utah, Wyo. and Idaho	**314,000**	260,000	358,000	**475,000**	475,000	**511,000**	509,000
California	**967,000**	806,000	**1,023,000**	905,000	941,000	**1,005,000**	1,105,000
Oregon and Washington	384,000	**403,000**	407,000	**439,000**	**471,000**	469,000	505,000
	17,223,000	16,124,000	**19,950,000**	18,083,000	17,325,000	**21,864,000**	23,824,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1929 and 1930

Month	—Production—		—Shipments—		Stocks at end of month	
	1929	1930	1929	1930	1929	1930
January	**9,881,000**	8,498,000	**5,707,000**	4,955,000	26,797,000	27,081,000
February	**8,522,000**	8,162,000	5,448,000	**7,012,000**	**29,870,000**	28,249,000
March	9,969,000	**11,225,000**	**10,113,000**	8,826,000	29,724,000	**30,648,000**
April	**13,750,000**	13,521,000	13,325,000	**13,340,000**	30,151,000	**30,867,000**
May	16,151,000	**17,249,000**	16,706,000	**17,224,000**	29,624,000	**30,891,000**
June	16,803,000	**17,239,000**	**18,949,000**	18,781,000	27,505,000	**29,364,000**
July	**17,315,000**	17,078,000	**20,319,000**	20,153,000	24,525,000	**26,289,000**
August	**18,585,000**	17,821,000	**23,052,000**	20,299,000	20,056,000	***23,824,000**
September	**17,223,000**	16,124,000	**19,950,000**	18,083,000	17,325,000	**21,864,000**
October	16,731,000	....	18,695,000	....	15,381,000	....
November	14,053,000	....	11,222,000	....	18,213,000	....
December	11,215,000	....	5,951,000	....	23,550,000	....
	170,198,000	....	169,437,000	....	....	....

*Revised.

MEN and MILLS

Notes from the Field

Richard K. Meade Passes Away After Illness

Word reaches CONCRETE, as it goes to press, of the death of Richard Kidder Meade on October 13th, after an illness of several months. Mr. Meade at the time of his death headed his own firm of consulting chemical and industrial engineers at Baltimore, Md.

Mr. Meade was born at Charlottesville, Va., in 1874, and matriculated at the University of Virginia and Lafayette College. He became chief chemist of the Edison Portland Cement Company in 1903 and later joined successively the old Northampton and Dexter Portland Cement companies. In 1904 he founded and began the editing of "The Chemical Engineer." Four years later he became the director of the Meade testing laboratories at Allentown, Pa., which he left in 1911 to become general manager of Tidewater Portland Cement Company. A year later he organized the firm which bears his name and which will now be reorganized.

As an author, Mr. Meade will probably be remembered best by his book on "Portland Cement," a volume on cement manufacture which has run through several revisions, the latest one in 1926.

Mr. Meade was also the author of the "Chemists' Pocket Manual" in 1900, as well as the inventor of numerous processes and appliances used in the cement industry. He was a member of the American Chemical Society, the Institute of Chemical Engineers, and the American Society of Mechanical Engineers.

Marquette Men on Pleasure Jaunt to Europe

T. G. Dickinson, president, and Richard Moyle, Oglesby (Ill.), plant superintendent, of the Marquette Cement Manufacturing Company, sailed early in October for Europe on a five weeks' pleasure and vacation trip.

They will spend most of their time in England and France.

Paul Van Zandt Is Appointed as Assistant to B. F. Affleck

The appointment of Paul R. Van Zandt as assistant to the president of the Universal Atlas Cement Company, at Chicago, was announced on October 1st. He has been assigned to duties in connection with operation and engineering. A. C. Wilby, for several years assistant to President B. F. Affleck, also continues in that position.

Mr. Van Zandt has had thirty years' experience in the cement manufacturing field in the United States, Canada, Mexico, Cuba, and the Orient, and was until recently chief engineer for the Ideal Cement Company at Denver, Colorado. He erected its plants at Fort Collins and other places. For five years he was chief engineer for the Asano Portland Cement Company, Tokyo, which has a daily capacity of 160,000 sacks. He built and started operation of five cement plants in Japan, designed, erected and started in operation five waste heat power plants, and changed cement shipments in the Japanese empire from wooden barrels to sacks.

Prior to his Japanese connection, Mr. Van Zandt was connected for 18 years with a cement machinery manufacturing firm, during which time he invented the double grinding mill.

Paul R. Van Zandt, recently appointed assistant to Universal Atlas president

Alpha Employes Hear Aviators' Tales of Adventure

Due to a truss broken while flying over Manheim, West Virginia, in two planes, Lieuts. Hanson, Roth and Palmer, all of the Navy, landed there on October 9th, and intermittently for three days, while awaiting the new part, told audiences gathered at the high school auditorium about their various experiences.

Lieut. Hanson had been one of the radio operators on the Byrd expedition at the South Pole, Lieut. Roth had made a transatlantic flight in the NC4 in 1919, and Lieut. Palmer had been on the Shenandoah on its last and fatal trip over Ohio. Alpha Portland Cement Company employes and their families filled the auditorium to capacity on each occasion, and most of them met the aviators personally.

Conservation Committee Meets to Prepare Report

Members of the Conservation Committee of the Portland Cement Association met on October 7th at Davenport, Iowa, to prepare reports on their progress.

Discussions were led by Raymond Bear, chairman of the committee, and engineer and vice-president of the Lehigh Portland Cement Company. Raymond Wilson, secretary of the association, arranged for the meeting.

Walter Heath, Asst. Buffington Superintendent, Dies

Funeral services for Walter A. Heath, assistant general superintendent of the Buffington, Ind., plant of the Universal Atlas Cement Co. since 1922, were held at Chicago, Ill., October 8th.

Mr. Heath had been with the company since 1904, serving successively as shop foreman, construction foreman, mechanical foreman, master mechanic, and assistant general superintendent in charge of mechanical operation.

Two months' illness preceded his death, which occurred October 5th. He was 67 years of age.

Oklahoma Plant Makes Substantial Recognition of Plant Safety Workers

The Department of Safety at the Oklahoma Portland Cement Company plant at Ada, Oklahoma, following a new policy adopted at the beginning of the year, has selected five of its foremen who were thought to have been most active in promoting safety, and awarded each a gold watch. They were as follows: George Hansard, foreman of the electrical group at the mills; Lee Higginbotham, foreman of Mill 2; Robert Bennett, foreman of the machine shop at the mills; Jeff Shields, foreman of the repair and machine shop group at the quarry, and O. B. Templeton, foreman of the track and powder group.

Five dollar gold pieces were also presented to several foremen for having done outstanding safety work, as follows: Charles Robinson, O. L. Hass, Ira Clark and Clark Dearman of the quarry; Sam McElroy, William Hensley, Claude McMillan, John Cragin, A. B. Auld, W. E. Breeden, Tom Cantrell, J. W. Gay, Mrs. Luella Turner, Ross White, and Sam Lamb of the mills.

Ever since 1925, the plant has celebrated each June with a barbecue if the employes of the mills and of the quarry went through the month without an accident. Each year the employes have won this barbecue for themselves and their families with the exception of 1928.

Smith, on Radio, Tells About Cement and Association

In his capacity as president of the Portland Cement Association, Frank H. Smith of the Lawrence Portland Cement Company, gave a 15-minute talk over Columbia Broadcasting System stations on the evening of September 13th.

In his address, entitled, "The Stone that You Can Mold," Mr. Smith told how portland cement has contributed to the progress of the nation and of the work of the association.

Establish New Cement Packing Record at Superior Plant

Records for packing cement were broken at the Superior Portland Cement, Inc., plant recently when Loaders Roy Clifford, Walter Jungblom and Andrew Azzola packed 2327¼ barrels of cement in eight hours.

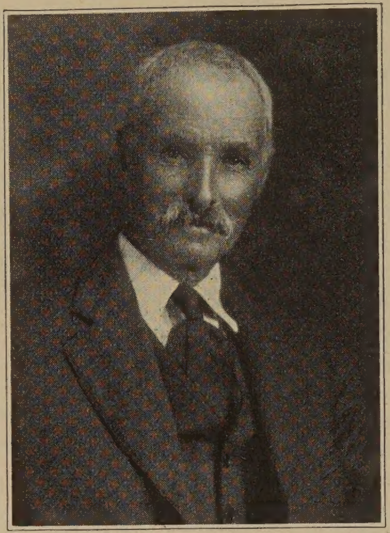
J. A. Blank's Daughter Weds

Miss Marquerite L. Blank, daughter of John A. Blank, general superintendent of the Superior, Ohio, plant of the Wellston Iron Furnace Company, became the wife of S. J. Morris, Ironton newspaperman, on October 12th.

Mrs. Morris was for four and one-half years affiliated with the Superior company's office as clerk and as secretary to her father.

Frank Marion New Superintendent of Oklahoma Quarry

Following his promotion to quarry superintendent for the Oklahoma Portland Cement Company at Lawrence, Okla., Frank Marion was honored by fellow employes and executives at a mass meeting held at the plant October 1st.



Frank Marion, recently promoted to the superintendency of the Oklahoma Portland Cement Company quarry at Lawrence, Okla.

Claude Rodarmel, plant superintendent, paid tribute to Mr. Marion and his record of nineteen years with the company. M. O. Matthews, local manager, after speaking of Mr. Marion's outstanding achievements in high production and effective safety work and his ability in getting his men to work with him to attain them, presented the new superintendent with a gold watch.

Mr. Marion, 67, was formerly track foreman. He attained his first foremanship while in the employ of middle western and southern railroads, and in 1903 became foreman of a large crusher. In 1908 he became foreman of the track and powder crews of the Oklahoma company, with which he has since been connected continuously.

Huey Tells Lions About Cement Making

Ray S. Huey, superintendent of the Universal Atlas Cement Company, spoke on the manufacture of cement before the Duluth (Minn.) Lions club on September 17th.

Fred Robinson, assistant superintendent, spoke on the same subject at the September 26th meeting of the Duluth Builders Exchange.

Klein, Hardy and Fullerton Visit Iowa Plants

Recent visitors in the vicinity of Valley Junction, Iowa, where they inspected either or both the Hawkeye and Penn-Dixie plants, were W. H. Klein, general manager of the southern division of Penn-Dixie; Edson Hardy, designing engineer at Richard City, Tenn., for Penn-Dixie, and Assistant General Manager Fullerton of the North American Cement Corporation.

New Water Well for West Penn Plant

Work has recently been completed on a 162 ft. water well at the plant of the West Penn Cement Company at West Winfield, Pa. Tests show 200 gals. delivered per minute. The water is intended for manufacturing use.

Senior Entertains Florida Football Team

John L. Senior of the Consolidated Cement Corp. was the host at a dinner given for the Florida football team at the University Club at Chicago on October 17th.

Southwestern Offices in New Location

The general offices of the Southwestern Portland Cement Company at Los Angeles, Calif., have been removed to the Roosevelt Building, 727 West Seventh Street.

Volunteer Offices Removed

The offices of the Volunteer Portland Cement Company have been removed from the Holston Bank building to the new Fidelity-Bankers Trust building at Gay and Union streets, Knoxville, Tenn.

Hutchinson Tells of Increased Efficiency in Packing When Shields Are Used

C. E. Hutchinson, foreman of the packing department at the plant of Superior Portland Cement, Inc., Concrete, Wash., delivered an interesting address entitled, "Safety in the Packing and Shipping Departments" at the regional safety meeting held in Seattle on September 9th.

He stressed the point that since the installation of dust shields minor accidents to the eyes and chest have been reduced to a minimum and that output has increased fifteen per cent.

Dewey Representative

The Dewey Portland Cement Company has appointed Platt B. Walker, Jr., as its representative in St. Paul, Minn.

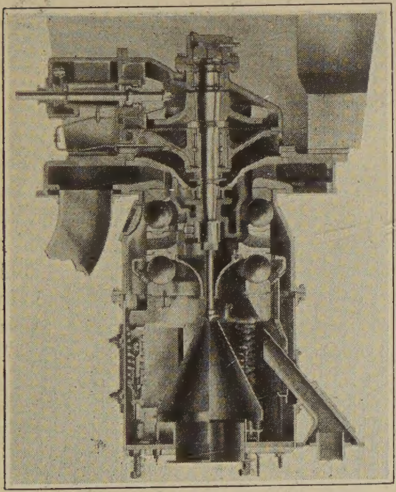
Mill Equipment

New Type B Pulverizer Has Simple Grinding Principle

The Fuller Lehigh Company, Fullerton, Pa., has recently placed on the market the new Type B pulverizer, which is an air separation ball mill. It retains all of the desirable features of the well-known Lehigh mill—including the spherical ball and grinding ring principle of pulverizing in which fineness is not affected by wear of grinding parts, and the absence from the grind-zone of parts that require lubrication, the company states.

Since the pressure between the balls and the grinding ring is an important factor in obtaining fineness and capacity, the new mill is so designed that this pressure—any amount desired—is obtained independently of the mill speed. This outstanding feature combined with the use of two full rows of balls grinding under high pressure and at low speed results in a quiet and smooth-running mill which gives high capacity and fineness, it is further stated.

The Type B pulverizer has no metal-to-metal abrasion of grinding parts, therefore wear of these parts is practically the result of coal abrasion. The balls wear spherically and the mill has exceptionally low maintenance and power consumption. The power consumed varies with the coal feed.



The Type B pulverizer consists essentially of a top or separator section, an intermediate or pulverizing section and a base or drive section.

The grinding elements consist essentially of two rows of large diameter balls, two stationary and one rotating grinding rings.

The main driving shaft is supported by a self-aligning heavy duty Rollway thrust bearing. No thrust or hammering, resulting from grinding, is imposed on the thrust bearing because the mill is so designed that all thrust from this source is absorbed by the heavy lower casing.

No lubrication is required within the grinding zone of the Type B pulverizer. All bearings and gears are effectively sealed from the grinding zone and are lubricated by an automatic force-feed oiling system.

Operation of a Type B pulverizer is quite simple. Raw coal, crushed to pass through a ¾-inch ring, is fed to the mill from an overhead bunker by means of an independent drag feeder. It drops through the feed spout onto a rotating cone inside the upper row of grinding balls, whence it is thrown outward into the path of the grinding balls by the centrifugal action of the revolving cone.

After the coal is ground in the upper row of balls, practically all of it is fine enough to pass through the annular opening formed by the intermediate grinding ring and the coal basket.

The pulverized coal, after passing through the annular opening, encounters currents of preheated air that enter the air distributing chamber in the base and are discharged through openings in the intermediate grinding ring. Fines are entrained and carried upward by the air stream, while the coarse particles of coal drop into the lower row of grinding balls for further pulverizing. Upon reaching the desired fineness the coal is carried upward by the air stream.

As the separating air currents sweep through the mill the fines are quickly removed from the grinding zones. The air streams move upward, inside and through the lower rows of balls and then outward through the cored holes in the intermediate ring. These changes in direction cause the coarse particles of coal to be returned to the lower grinding balls. A similar action occurs as the coal stream again changes its direction and sweeps upward to the top of the mill. An adjustable sleeve installed at the discharge opening of the mill prevents the coal stream from short-circuiting passage through the classifying cone.

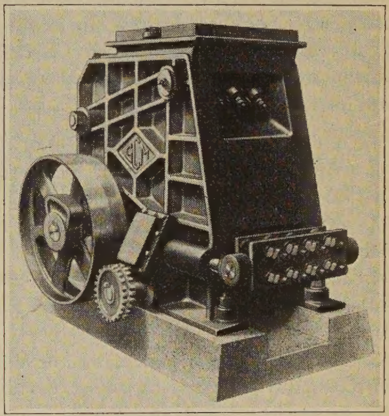
As the pulverized coal reaches the top of the mill, coarse particles, carried upward with the fines, are rejected from the coal stream by either the force of gravity or action of the classifier. The coarse particles return to both rows of grinding balls for further pulverizing.

The Type B mill is well adapted to the use of pre-heated air as a separating medium so that it can be adapted to installations where drying within the mill is to be used, eliminating the expense of independent drying and conveying equipment.

Announce New Principles of GCM Crusher

Announcement of a radical improvement in its new GCM yielding jaw rock crusher is announcement by the Guest Crushing Machines, Inc., at Los Angeles, Calif.

The crusher incorporates the yielding jaw principle and utilizes roller bearings throughout. The crushing action, after material is crushed to size, is downward for ⅛ of each revolution, serving to give an added impetus over the action of a free-falling body. The machine may be used as a primary and secondary crusher or as either. The 6 by 16 in. size will handle nine tons of rock per hour when set at ¼ in. This takes into consideration a maximum feed of 6 in. materials, delivering a uniform crushed product of 5/16 in. size. The ratio of reduction in this particular case is 19 to 1.



Fifteen GCM features include the breakable shear pin to prevent throwing the motor shaft out of alignment in case foreign material becomes lodged in the crusher jaws. Provision is also made for instant release of this foreign matter without the necessity of explosives or expensive dismantling. All working parts are readily accessible, while the size adjustment of the finished product can be accomplished while the machine is operating.

The bearings used are the Norma Hoffmann roller type with positive oil and dust seal.

The unit comprising the fly-wheel pulleys, shaft and bearings is precision balanced before assembling in crusher, so that there is a minimum of vibration, and a reduction in horsepower. The manganese jaw plates may be easily removed without dismantling crusher. The eccentric jaw plate is reversible.

The crushing action is such as to accelerate the passage of sticky material that would ordinarily ball up in any other type of crusher. Particular attention has been paid in design to the matter of weight. All GCM crushers are easy to transport, yet their capacity in relation to their weight is 50 per cent greater than any other type of crushing machine, it is stated. Material saving is also effected in the horsepower consumed as power curves tend to show that the crusher will operate 25 per cent under any other crusher of similar size and based on the quantity of crushed product delivered per hour.

A new catalogue has just been issued on the Guest crushing machines, and is available from the Guest Crushing Machines, Inc., 107 Annandale Blvd., Los Angeles, Calif.

New Additions Made to Photo-Electric Relay Line

A number of new items have been added by General Electric to its line of photoelectric relays for the control of industrial machinery and other devices. In addition to the original unit, designated CR-7505-A-2, an alternating-current relay, there are now introduced the following:

1. A direct-current relay, CR-7505-B-1.
2. An outdoor weatherproof, a-c. relay, CR-7505-C-2.
3. An interior light control unit, CR-7505-D-1.
4. Interior measuring devices, both a-c. and d-c., designated CR-7505-E-1 and F-1, respectively.
5. An indoor light source, a-c. or d-c., CR-7500-A-1.
6. An outdoor, weatherproof light source, CR-7500-B-1, for alternating current.

With these additions to the line, units are provided for a large variety of applications, both indoors and outdoors.

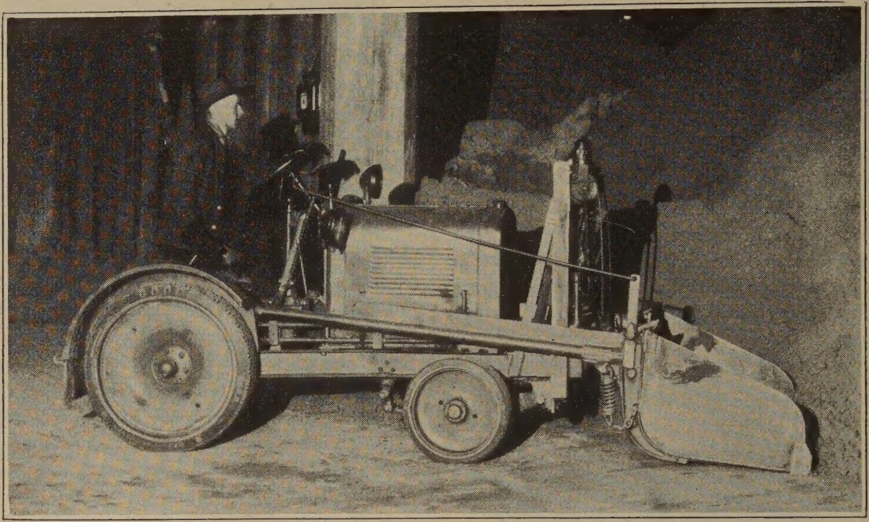
New Automatic Starters for A. C. Multi-Speed Motors

A new line of enclosed automatic motor starters for two speed separate winding type squirrel cage motors is announced by Cutler-Hammer, Inc., Milwaukee, Wis. These starters are the across-the-line type. The windings are connected directly to the line. Both windings are protected against dangerous overloads by means of C-H thermal overload relays, it is stated. A push-button master switch with "stop," "low" and "high" buttons is used to obtain control from a remote point.

Features of Clarktor Shovel, for Bulk Materials

The new Clarktor shovel is a power scoop, designed to handle bulk cement, clay, soft coal, etc. It is said to do the work of ten to fifteen shovel and barrow men.

The standard bucket holds 9 cu. ft. or 1500 lbs., though larger cubic capacity buckets are furnished when material to be handled is lighter than sand. Improved hydraulic cylinders enable the driver to pick up and hold the load at any desired point. The scoop approaches the pile, takes its load and carries it away, dumping it where it is wanted. Two models of different heights are available, one having an under-bucket clearance, with bucket in dumped position, of 3 ft. 9 in., and the other of 6 ft. 5 in.



The chassis is a sturdy tructractor having the short turning radius of 108 in. Standard truck transmission, multiple disc clutch and Clark truck axle insure dependable service. Equipment includes starter, generator, battery, head and tail lights. Tractor type gas engine uses five or six gallons of gas and a pint of oil per day. The Clarktor shovel is manufactured by the Clark Tructractor Co., Battle Creek, Mich.

Pacific Type Is Simplified Belt Conveyor Carrier

A new roller bearing belt conveyor carrier, known as the Pacific type, has been developed by the Stephens-Adamson Mfg. Co. of Aurora, Ill. Timken bearings are used throughout and the carrier is featured for use wherever a high-grade conveyor of medium price is wanted.

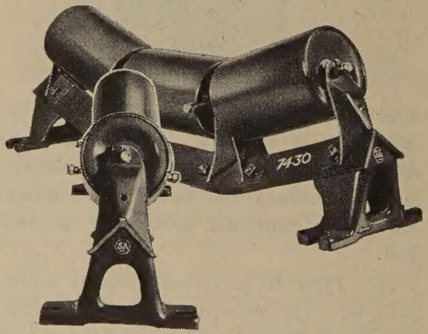
It is of the three-roller, 20 deg. trough design. The construction is of heavy gauge pressed steel, with the exception of the end stand castings.

Each roller turns upon two Timken tapered roller bearings housed within an inner hub of steel tubing and protected from dust and moisture by an intermeshing labyrinth grease seal for each bearing. The tapered roller bearings used are large in size and are arranged to carry end thrust as well as radial loads. The inner hub extends the full length of each roller. A unique arrangement has been provided for adjusting and setting the bearings for proper clearance. Positive lubrication is insured by an individual Alemite fitting for each bearing.

Every roller, with its bearings, shaft and grease seals, is a self-contained unit that can easily be interchanged with any other roller without disturbing the bearing adjustment.

The cross member is a single structural steel angle, formed and punched to eliminate all but one standard pressed steel bracket that is interchangeable for all sizes of carriers.

In many respects the Pacific type is similar to the Stephens-Adamson Simplex carrier. In announcing this new carrier, the manufacturer states that in addition to making several improvements, the simplified design of the roller brackets and supports will now make it possible to sell the Pacific type within the medium price range.



The Pacific carrier is built in sizes for conveyor belts from 18 to 48 in. wide. The manufacturer further states that clearance dimensions such as backing, bolt spacing and overall dimensions are practically the same as other types of carriers of their manufacture.